angles, including a steering neutral position, is smaller than a second backlash in a second range of steering angles. At least one of the driven gear and the driving gear comprises a bias portion that sets the first backlash. The driven gear includes the bias portion formed by biasing a part of an outer periphery of teeth in a direction in which the first backlash is decreased.

Conventional electric power steering apparatuses try to strike a balance between a large backlash which reduces resistance to steering assistance, but which increases the amount of noise due to steering feedback from the tires of the vehicle, and a small backlash which increases resistance to steering assistance, but which reduces the steering feedback noise. However, these systems have provided a backlash which provides a proper balance.

In stark contrast, the present invention provides a proper balance by providing a first backlash between the driving gear and the driven gear in a first range of steering angles, including a steering neutral position, is smaller than a second backlash in a second range of steering angles. In this manner, the present invention may obtain the benefits of a smaller backlash in the neighborhood region of a steering neutral position and the benefits of a larger backlash in a remaining region. Thus, the present invention both reduces resistance to steering assistance from a steering assist motor and also suppresses noise due to steering feedback from the tires. (Page 2, line 22 - page 3, line 22).

In the "Response to Remarks" section of the April 28, 2006, Office Action, the Examiner alleges that "biasing a part of an outer periphery of teeth in a direction in which . . . backlash is decreased is broad." (Emphasis original).

However, whether or not a claimed invention "is broad" is irrelevant to whether such an invention is patentable. U.S. Patent Law does not permit the Examiner to deny any patent applicant a patent simply because the Examiner is of the opinion that a claimed invention "is broad."

In the "Response to Remarks" section of the October 18, 2006, the Examiner alleges that this opinion is misguided because the Examiner is interpreting the language in a broad manner and that the "Examiner is clearly referring to the claim language." However, as explained in detail below the Examiner continues to ignore the language of the claims and as such is overly broadly interpreting the claims.

As to the Examiner being "unclear how the Examiner is to 'examine/consider' claims without doing so", well, the Examiner has repeatedly illustrated the ability to improperly

examine the claims by ignoring the language of the claims.

The claims recite, for example, providing a first backlash between the driving gear and the driven gear in a first range of steering angles, including a steering neutral position, that is smaller than a second backlash in a second range of steering angles. In this manner, a backlash between the driving gear and the driven gear in a range of steering angles including a steering neutral position is set relatively small so that noises produced during straight travel can be prevented, and the backlash in the other range of steering angles is set relatively large so that the increase in the resistance torque can be suppressed.

Applicants respectfully request that the Examiner refer to the claim language when evaluating the patentability of the claims.

II. THE PRIOR ART REJECTIONS

A. The Mizukoshi et al. reference

Regarding the rejection of claims 1, 3-10, 12-15, 17-18, and 20-31, the Examiner alleges that the Mizukoshi et al. reference teaches the claimed invention. Applicants submit, however, that there are elements of the claimed invention which are neither taught nor suggested by the Mizukoshi et al. reference.

In the Response to Remarks section of the October 18, 2006, Office action, the Examiner alleges that the "Applicant's (sic) remarks are groundless because he/she is implying more than is claimed; i.e. a specific description of the 'second backlash' is necessary to distinguish it as Applicant (sic) implies. In this manner, the above-mentioned claim language is arguably obviated in Mizukoshi (sic) – "an appropriate backlash can be maintained.'" (Emphasis original).

The Examiner's reference to "the above-mentioned claim language" is a reference to the Examiner's earlier statement of: "wherein a first backlash . . .is smaller than a second backlash." Applicants note that the Examiner has intentionally omitted language from the claims in this statement.

Contrary to the Examiner's allegation, Applicants are not implying more than what is claimed.

Rather, the Examiner is clearly ignoring the claim language.

The Applicants have not alleged that the applied references do not teach or suggest "wherein a first backlash . . .is smaller than a second backlash."

Rather, the Applicants are traversing upon the basis that:

"None of the applied references teaches or suggests the features of the claimed invention including a first backlash between the driving gear and the driven gear in a first range of steering angles, including a steering neutral position, is smaller than a second backlash in a second range of steering angles. As explained above, this feature is important for reducing resistance to steering assistance from a steering assist motor and also suppressing noise due to steering feedback from the tires." (Page 4, lines 7-12 of the July 27, 2006, Office Action).

Clearly it is the Examiner who is ignoring the claim language. The Examiner's reference to "wherein a first backlash . . .is smaller than a second backlash" very clearly omits features recited by the claims which the Applicants have consistently pointed out that the applied references do not teach or suggest.

In particular, the Applicants have consistently traversed based upon the claim language of a first backlash between the driving gear and the driven gear in a first range of steering angles, including a steering neutral position, is smaller than a second backlash in a second range of steering angles. The underlined portions of this claim language is clearly being ignored by the Examiner.

The Applicants are not "implying more than that claimed." To the contrary, the Applicants have consistently traversed upon the basis of the claim language.

In stark contrast, it is the Examiner who has ignored the claim language and the Examiner's omission in the Examiner's "above-mentioned claim language" is yet one more example of this failure.

As repeatedly explained, none of the applied references teaches or suggests the features of the claimed invention including a first backlash between the driving gear and the driven gear in a first range of steering angles, including a steering neutral position, is smaller than a second backlash in a second range of steering angles. This feature is important for reducing resistance to steering assistance from a steering assist motor and also suppressing noise due to steering feedback from the tires.

The Mizukoshi et al. reference very clearly does not teach or suggest anything at all about a backlash in a first range of steering angles being different than any other range of steering angles, let alone that a backlash in a range near a steering neutral position is smaller than a remaining steering operational range.

Rather, the Mizukoshi reference teaches a variable gear ratio steering gearing. In particular, the Mizukoshi et al. reference teaches a variable gear ratio steering gearing that has a gear ratio that increases as the steering angle increases. (Col. 1, lines 59 through 66).

The examiner alleges that the Mizukoshi et al. reference discloses a bias portion in which a first backlash is decreased with respect to a second backlash and cites column 3, lines 27 through 28 in an attempt to support that allegation. However, contrary to the examiner's allegation the Mizukoshi et al. reference does not support the examiner's allegation.

Rather, column 3, lines 27 through 28 of the Mizukoshi et al. reference only discloses that an appropriate backlash can be maintained in engagement with the sector gear. In other words, the Mizukoshi et al. reference teaches that the backlash may be adjusted such that it is consistent (i.e. the same) across all operating angles.

The Mizukoshi et al. reference does not teach or suggest that the backlash changes, let alone changes with respect to the steering angles, or changes such that a first backlash in a range of steering angles including a steering in neutral position is smaller than a second backlash in a second range of steering angles, as recited by the claims.

The Examiner admits that the Mizukoshi et al. reference "does not specify a first backlash in a first range of steering angles, this backlash being less than a second backlash in a second range of steering angles." In other words, the Examiner admits that the applied reference does not teach or suggest the features that are claimed by the present invention.

The Examiner appears to attempt to circumvent this requirement for an obviousness rejection by making completely irrelevant remarks.

Firstly, the Examiner alleges that "this feature is application-specific, and would have been obvious to one skilled in the art as specificity within an expected range of steering characteristics." Such an allegation does not remedy the deficiency in the obviousness rejection because this allegation, even if assumed to be true, does not provide any reference which discloses the claimed feature.

The Examiner's allegation that the feature is application-specific would only be relevant AFTER the Examiner had provided a reference which disclosed a backlash in a first range of steering angles being different than any other range of steering angles. The "application specific" allegation would only be relevant to whether the backlash was smaller in either the first range or the second range of steering angles.

However, the Examiner never reaches this point because the Examiner continues to fail to provide any reference at all which discloses a backlash in a first range of steering angles being different than any other range of steering angles.

Secondly, the Examiner appears to attempt to allege that the certain unclaimed features are "well-known". The Examiner alleges that "Backlash is well-known to occur in the operation of gears, and can be adjusted by various means, including varying the shape of gear teeth."

However, even assuming arguendo, that the Examiner's allegation is taken to be true, the allegation is irrelevant to the patentability of the claimed invention.

The Examiner's allegation that backlash is know to be adjusted by various means, including varying the shape of the gear teeth, does not have any relevance at all to whether the applied reference discloses the claimed features or whether the claimed features are well known.

If the Examiner intends to allege that the claimed features are "well-known" the Applicants respectfully hereby demands that the Examiner support such allegation by producing documentary evidence supporting the Examiner's allegation that the claimed features are well-known or the Examiner must withdraw the rejection. (M.P.E.P. Section 2144.03.C.).

Regarding claims 4-7, 17-18, and 26-28, the Examiner alleges that the claimed features are "clearly application-dependent. The 'ranges' would have been obvious as within those expected as a result of experimentation/development."

However, this allegation also fails.

Before the Examiner may successfully allege that a range may be optimized through experimentation, "A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation." (M.P.E.P. Section 2144.05.II.B.).

In the present instance, the Examiner has failed to apply any reference that discloses a first backlash in a range of steering angles including a steering in neutral position is smaller than a second backlash in a second range of steering angles, as recited by the claims, let alone apply any reference that discloses that the ranges of steering angles in which the respective first and second backlashes are effective, have any effect upon any result. In other words, the

Examiner has failed to apply any reference which discloses that the claimed feature is a result-effective variable.

Similarly, with respect to claims 8-10, 13-15, 23-25, 29, and 31, the Examiner alleges that the claimed features are "application-dependent, and would have been within an expected range of result of experimentation.

However, again, this allegation fails because the Examiner has failed to apply any reference which discloses that the claimed features are result-effective variable. Thus, the Examiner's rejection is insufficient on its face.

The examiner has also alleged that the Mizukoshi et al. reference discloses that the driven gear and the worm wheel are inherently offset from each other. However, the Mizukoshi et al. reference does not teach or suggest that the driven gear and that driven wheel and the worm wheel are inherently offset from each other.

> "To establish inherency, the extrinsic evidence must make clear that the missing descriptive matter is necessarily present in the thing and described the reference, and that it would be so recognized my persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient."
>
> "In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the end allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." (Emphasis original, M.P.E.P. section 2112.IV.).

In the present instance, the examiner has failed to prove that the driven gear and the worm wheel are necessarily offset from each other. Indeed, the examiner has not even attempted to provide a basis in fact and/or any technical reasoning to reasonably supports the examiner's allegation that the driven gear and the worm wheel are inherently offset from each other.

The Mizukoshi et al. reference does not teach or suggest anything at all regarding a driven gear and a worm gear being offset from each other.

Additionally, the examiner has failed to present a *prima facie* case for obviousness.

> "To establish a *prima facie* case of obviousness, three basic criteria

must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of the success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations." (Emphasis added, M.P.E.P. section 2143).

Indeed, the examiner admits that the examiner has failed to present a *prima facie* case for obviousness because the examiner admits that the Mizukoshi et al. reference "does not specify a first backlash and a first range of steering angles, this backlash being less than a second backlash and a second range of steering angles."

In the Response to Remarks section of the October 18, 2006, Office action, the Examiner appears to make an attempt to respond to this traversal.

In particular, the Examiner acknowledges the Applicants traversal on the basis that the Mizukoshi et al. reference does not teach or suggest the claimed feature of "a shaft center of the worm is offset in an axial direction of the worm wheel by a predetermined offset amount," as recited by, for example, claim 3. This feature is illustrated by the present specification at, for example, Figure 6. The shaft center 10 of the worm 11 is offset in an axial direction X of the worm wheel 12 by a predetermined offset amount P.

The Applicants have traversed the Examiner's rejection by pointing out that the Mizukoshi et al. reference very clearly does not teach or suggest this feature.

However, in the Examiner's Response to Remarks, the Examiner attempts to shift the burden to the Applicants by asking the Applicants "to refer to (at least) fig 3 (sic), that clearly depicts this relationship, where the teeth of the gears engage each other, the gears positioned at different angles, as (sic) very well-known."

Firstly, Figure 3 of the Mizukoshi et al. reference does not illustrate any relationship at all between any worm wheel or worm shaft at all. Rather, this figure illustrates a "sector gear cutting operation" (col. 1, lines 43-44). Figure 3 illustrates a "sector gear 2" (col. 2, lines 28) being cut by a "basic rack type gear cutter R" (col. 2, line 39). Therefore, since Figure 3 of the Mizukoshi et al. reference does not illustrate any worm shaft at all, Figure 3 clearly does not support the Examiner's allegation by disclosing a shaft center of the worm is offset in an axial direction of the worm wheel by a predetermined offset amount, as recited by, for example, claim 3.

Secondly, Examiner allegation that Figure 3 provides evidence that shows that "gears positioned at different angles, as (sic) very well-known" is irrelevant. The claims do not claim "gears positioned at different angles."

Again, the Examiner is requested to refer to the language of the claims when attempting to determine patentability.

Thirdly, even if Figure 3 illustrated a worm wheel 2 engaging a worm shaft, the perspective of Figure 3 makes it impossible to determine whether a center of a worm shaft would be offset in the axial direction of the worm wheel 2. The perspective provided by Figure 3 of the worm wheel 2 provides the axial direction of the worm wheel 2 to extend perpendicularly to the two-dimensional drawing (i.e., into and out of the paper). Thus, the perspective of Figure 3 is not capable and does not illustrate the relative positioning of elements in an axial direction of the worm wheel 2.

Applicants respectfully request withdrawal of the rejection of claims 1, 3-10, 12-15, 17-18, and 20-31.

B. The Mizukoshi et al. reference in view of the Kojo et al. reference

Regarding the rejection of claim 32, the examiner alleges that the Kojo et al. reference would have been combined with the Mizukoshi et al. reference. Applicants respectfully submitted that the applied references do not teach or suggest the features of the claimed invention and that one of ordinary skill in the art would not have combined these references.

None the applied references teaches or suggests the features of the claimed invention including a first backlash between the driving gear and the driven gear is smaller in a first range of steering angles than a second backlash in a second range of steering angles. This feature is important for reducing resistance to steering assistance from a steering assist motor and also suppressing noise due to steering feedback from the tires.

As explained above, the Mizukoshi et al. reference does not teach or suggest these features.

The Kojo et al. reference does not remedy the deficiencies of the Mizukoshi et al. reference.

Rather, the Kojo et al. reference discloses a steering apparatus with a controller that controls the transmission ratio in order to control the effects of motor inertia.

The Kojo et al. reference does not mention anything at all that is even remotely

related to backlash, let alone disclose a bias portion that sets backlash, or at least one of a driving gear and a driven gear that has a bias portion which sets the backlash between the driving gear and the driven gear at least in a neighborhood region of a steering neutral position to be smaller than that in a remaining region.

Indeed, the Examiner does not allege that the Kojo et al. reference teaches or suggests anything at that is even remotely related to backlash.

In the Response to Remarks section of the October 18, 2006, Office Action, the Examiner alleges that it is improper to render a separate analysis of the Kojo et al. reference, rather than in combination with the Mizukoshi et al. reference as intended. In particular, the Examiner argues that the Kojo et al. reference "is not required to disclose backlash, as Applicant implies." (emphasis original).

In this regard, Applicants respectfully remind the Examiner that:

> "To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of the success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations." (Emphasis added, M.P.E.P. section 2143).

Thus, since as admitted by the Examiner, the Examiner is relying upon a combination of references, in order to establish a *prima facie* case of obviousness, the Examiner must prove that the "references" teach or suggest all of the claim limitations. In other word, it does not matter which of the applied references disclose the claim limitations. In order for the Examiner to successfully satisfy this requirement only one of the applied references need to disclose the claimed limitations.

Since, as clearly explained above, the Examiner has failed to prove that the Mizukoshi et al. reference discloses the claimed features, the Examiner is permitted to rely upon the Kojo et al. reference to remedy the deficiencies of the Mizokoshi et al. reference.

The Applicants are merely pointing out that the Kojo et al. reference does not remedy the deficiencies of the Mizokoshi et al. reference.

Therefore, the Examiner is incorrect in stating that the Kojo et al. reference "is not required to disclose backlash" because since the Mizokoshi et al. reference clearly does not

disclose the claimed features, if the Examiner expects to satisfy the requirements of a *prima facie* case for obviousness, the Kojo et al. reference is required to disclose the claimed features.

Thus, the Applicants are making it clear for the Examiner that the Kojo et al. reference also does not teach or suggest the features of the claimed invention including a first backlash between the driving gear and the driven gear is smaller in a first range of steering angles than a second backlash in a second range of steering angles, and, therefore, does not remedy the deficiencies of the Mizokoshi et al. reference.

Further, Applicants submit that these references would not have been combined as alleged by the Examiner. Indeed, the references are directed to completely different matters and problems.

The Mizukoshi et al. reference is concerned with the problem of providing a variable gear ratio steering gear incorporating a sector gear which has sufficient strength and an ideal tooth form for an engagement with the ball nut. (Column 1, lines 19 through 24).

In stark contrast, the Kojo et al. reference is concerned with the completely different and unrelated problem of motor inertia which is sensed by a driver manipulating the steering wheel which adversely affects steering feeling. (Col. 1, lines 19-27).

One of ordinary skill in the art who was concerned with the problem of providing a variable gear ratio steering gear incorporating a sector gear which has sufficient strength and an ideal tooth form for an engagement with the ball nut, as the Mizukoshi et al. reference is concerned, would not have referred to the Kojo et al. reference and vice-versa because the Kojo et al. reference is directed to the completely different and unrelated problem of motor inertia which is sensed by a driver manipulating the steering wheel which adversely affects steering feeling. Thus, the references would not have been combined.

Therefore, the Examiner is respectfully requested to withdraw the rejection of claim 32.

III. FORMAL MATTERS AND CONCLUSION

In view of the foregoing amendments and remarks, Applicants respectfully submit that claims 1, 3-10, 12-15, 17-18, and 20-32, all the claims presently pending in the Application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at

the earliest possible time.

Should the Examiner find the Application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

Date: 12/28/06

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CERTIFICATION OF FACSIMILE TRANSMISSION

I hereby certify that I am filing this Request for Reconsideration by facsimile with the United States Patent and Trademark Office to Examiner Lee Sin Yee Lum Vannucci, Group Art Unit 3611 at fax number (571) 273-8300 this 28th day of December, 2006.

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